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by

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(Plate XXXII)

In the Magellan region Lesson (in 1830) collected a peculiar Polycitorid species of Ascidian which he described under the name of *Holozoa cylindrica*.

This find was long forgotten, and when several specimens were later collected in Antarctic waters, this same species was described under different generic and specific names. This fact has been pointed out by previous authors. Calman's *Julinia australis* and Herdman's *Distaplia ignota*, likewise Sluiter's *Julinia ignota*, which have all been collected in the Antarctic, are no doubt representatives of *Holozoa cylindrica*.

With regard to the external form and shape of the colonies, as well as of the zooids, the previous descriptions agree in essential points. I will return to a discussion of this matter in another paper, in which additional comments may be made. The reproductive organs only will be dealt with in this preliminary note.

The common view is that the colonies and the zooids in them are gonochoristic, i.e. either male or female. But Calman's statement (1895) as to this character is not quite clear. He writes: 'In all the individuals examined several ova were found in various stages of development...' (loc. cit. p. 10); and further at the bottom of the same page: 'In nearly all the specimens examined hardly a trace of testis could be found, although the vas deferens was usually full of spermatozoa. In one or two cases, however, the testis was developed' (p. 11). And further, on the same page: 'No definite relation between the states of maturity of ovary and testis such as would suggest the occurrence of protandry or protogyny could be demonstrated.'

Michaelsen has pointed out that Herdman's *Distaplia ignota* is no doubt identical with *H. cylindrica* Lesson, though he has accepted the generic name *Julinia* proposed by Calman. He writes in his description that the colonies of the species in question seem to be either male or female. '*Julinia* scheint wie *Colella*—getrennt geschlechtliche Kolonien zu produzieren' (1907, p. 41).

Hartmeyer, too, is of the same opinion. He has had abundant material at his disposal, and the result of his investigation is that the colonies examined by him are gonochoristic.

With regard to Calman's description Hartmeyer (1911) remarks: 'Immerhin scheint mir nach allem, was Calman über die Geschlechtsorgane sagt, sein Material nicht günstig genug gewesen zu sein, um aus seinen Beobachtungen einen sicher begründeten Einwand gegen die von Michaelsen und mir auf Grund gewichtigen Tatsachenmaterials angenommene Eingeschlechtlichkeit der Kolonien herzuleiten' (loc. cit. p. 484).

I now have reason to return to the subject, having had occasion to examine colonies of *Holozoa cylindrica* collected by the Discovery Expeditions and also a few colonies brought back by the British Graham Land Expedition (with the 'Penola'). The Discovery material was taken by dredge in the mouth of East Cumberland Bay, South Georgia, 200–234 m. (St. 149), 10 January 1927, and that from the British Graham Land Expedition was taken at Stella Creek, surface, 5 December 1935.

The result of this investigation refutes the above-mentioned view of Hartmeyer and Michaelsen, and gives proofs for an opinion opposite to that of these authors, for, as will be shown below, the species in question prove to be hermaphrodite.

The figures given here (Plate XXXII) of zooids from the above-mentioned material support in an indisputable way the view of the hermaphroditism of *H. cylindrica*. As is shown in Plate XXXII, fig. 1, illustrating an individual from a colony collected by the Discovery Expedition, in January, the female and the male reproductive organs are both present. They are situated on the right side of the body, on the bend of the intestine. The testis is placed to the side of the ovary. A large brood-pouch is developed on the dorsal side of the thorax.

In the zooid figured the ovary consists of two large eggs. In some zooids two to three large eggs have been observed at the same time. The oviduct is thin-walled, long and broad, running along the ascending part of the intestine. The distal part is narrow. In the figure the oviduct is seen entering into the brood-pouch with its distal narrow part. As mentioned above, the brood-pouch is well developed. It is in the form of a large rounded sac.

The testis is well distinguished, though not very much developed in the individual in question. It consists of small rounded glands, which seem more or less emptied of their contents. The vas deferens is represented by a wide duct of considerable length and with several windings. It is situated on the external side of the oviduct and runs up along the intestine and the rectum. It opens at the side of the anus, and its distal part is seen in the figure given.

The individual illustrated in Plate XXXII, fig. 2, is from a colony dredged by the British Graham Land Expedition at Stella Creek, in December. In this zooid the male reproductive organs are in a highly developed stage. The testis consists of a great number of glands, of rounded or oval shape, forming a large mass of mulberry-like aspect. The vas deferens is still a narrow tube, sinuous, but shorter, being without the deep windings seen in the Discovery sample described above. It accompanies the ascending branch of the intestine.

Of the female reproductive organs, however, only rudimental traces are to be seen. Three small follicles of whitish colour situated on the external side of the testis (cf. Plate XXXII, fig. 2) represent no doubt the ovary. The oviduct could not be distinguished. A rudiment of the brood-pouch is distinctly to be seen, though it is only little developed.

The facts pointed out above prove that *H. cylindrica* is hermaphrodite. The colonies and the zooids are not either male or female, as is the view of several previous authors. But whether the male and the female reproductive organs attain their full development at the same time or at different seasons is another problem.

If we consider the states of maturity of the reproductive organs in the zooids figured and the difference in season when the material was collected, certain conclusions may be justified.

The zooid shown in Plate XXXII, fig. 2, is from a colony taken in December, the last month of the year, i.e. early in the Antarctic summer. The zooid shown in fig. 1 is from a colony taken in January, the first month of the year, i.e. in the full summer in the Antarctic region.

In the first-mentioned individual the male reproductive organs are highly developed, and the testis seems to have attained its full maturity. The vas deferens is a long sinuous tube. The female reproductive organs are in a rudimentary stage. The ovary is represented by three small ova, and the oviduct is not to be seen. The rudiment of the brood-pouch is in the form of a small vesicle.

In the individual from the colony dredged in the Antarctic summer the female reproductive organs are in their full development. The ovary consists of large ova, the oviduct is distinctly differentiated, and the brood-pouch is represented by a large rounded vesicle attached to the body by means of a narrow neck. The male reproductive organs seem to be in a reduced stage. The testis consists of a small number of thin follicles lying at the side of the ovary, but the vas deferens is still a duct of great length and width, winding up along the intestine and the rectum.

From the state of maturity of the reproductive organs mentioned above it is apparent that the male

organs attain their full development early in the Antarctic summer, and the female organs later during the full Antarctic summer. The former are thus mature in advance of the female. The conclusion which might be drawn from these facts seems thus to point to the occurrence of protandry in *H. cylindrica*.

According to Hartmeyer and Michaelsen, and also Van Name (1945) other Polycitorid genera too, for instance *Sycozoa* and *Sigillina*, are gonochoristic, the colonies and the zooids from the same colony being either male or female (see Bronn's Tier-Reich). The fact that *Holozoa cylindrica* is hermaphrodite raises the question whether these genera in fact also possess this peculiar character.

In his paper *Ascidiae Krikobranchiae von Neuseeland, den Chatham- und den Auckland-Inseln* (1924), Michaelsen has in some degree receded from this opinion. In the above-mentioned paper of his he proposes to unite the nearly allied forms *Holozoa* and certain species of *Sycozoa* under a common generic name *Distaplia*.—*Holozoa* and *Distaplia* are considered by Hartmeyer as identical (loc. cit. p. 1437).—In his diagnosis of the genus *Distaplia* Michaelsen mentions as one of the generic characters 'Personen zwittrig oder Kolonien getrennt geschlechtlich; ein enggestielter Brutsack vorhanden, 1 Embryo oder deren mehrere enthaltend' (loc. cit. p. 297). 'In der Gattung *Distaplia* s.s. kommen dagegen sowohl Arten mit getrenntgeschlechtlichen Kolonien vor, sowie solche mit Kolonien, deren Personen zwittrig sind' (loc. cit. p. 321). According to this author the species of this genus are thus either gonochoristic or hermaphrodite. In *Distaplia* (*Holozoa*) *cylindrica* and the 'cerebriforme-Gruppe', the colonies and the zooids are of the same sex, but in other species of *Distaplia* they are hermaphrodite.

Taking into consideration what has been adduced above, it is evident that until further evidence is forthcoming by way of thorough investigations nothing can be stated for certain, whether certain Polycitorid forms are in reality gonochoristic, or whether, just as in *Holozoa*, an investigation of suitable material collected in various seasons might prove them to be hermaphrodite.

LITERATURE

CALMAN, W. T., 1895. *On* Julinia; *a new genus of Compound Ascidians from the Antarctic Ocean.* Quart. Journ. Micr. Sci., new ser., XXXVII. London.

HARTMEYER, R., 1909–11. Ascidien in Bronn's Klassen und Ordnungen des Tier-Reichs. III, Suppl. Leipzig.

—— 1911. *Die Ascidien der Deutschen Südpolar-Expedition* 1901–1903. D. Südp.-Exp. XII. Berlin.

MICHAELSEN, W., 1896–1907. Tunicaten, in Ergebnisse d. Hamburger Magalhaensischen Sammelreise 1892–1893, I. Hamburg.

—— 1924. *Ascidiae Krikobranchiae von Neuseeland, den Chatham- und den Auckland-Inseln.* Vidensk. Meddel. fra Dansk Naturh. Foren. LXXVII. Odense.

VAN NAME, W. G., 1945. *The North and South American Ascidians.* Bull. American Mus. Nat. Hist. LXXXIV. New York.

PLATE XXXII

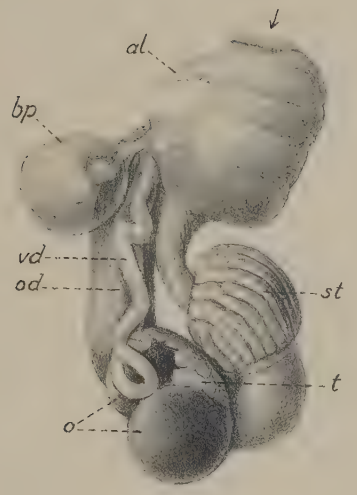
Fig. 1. Holozoon cylindricum. Zooid, seen from the right side. × 18. *ad*, atrial languet; *bp*, brood-pouch; *o*, ovary; *od*, oviduct; *st*, stomach; *t*, testis; *vd*, vas deferens.

Fig. 2. H. cylindricum. Zooid, seen from the right side. × 18. *ad*, atrial languet; *bp*, brood-pouch; *o*, ovary; *st*, stomach; *t*, testis; *vd*, vas deferens.

PLATE XXXII

Fig. 1. *Holozoa cylindrica.* Zooid, seen from the right side. × 18. *al*, atrial languet; *bp*, brood-pouch; *o*, ovary; *od*, oviduct; *st*, stomach; *t*, testis; *vd*, vas deferens.

Fig. 2. *H. cylindrica.* Zooid, seen from the right side. × 18. *al*, atrial languet; *bp*, brood-pouch; *o*, ovary; *st*, stomach; *t*, testis; *vd*, vas deferens.



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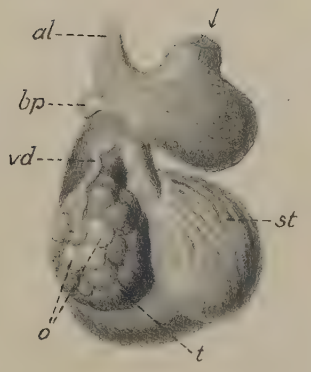

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HOLOZOA CYLINDRICA LESSON